

## **Use of ar Technologies in the Context of Digital Transformation**

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### **Annotation**

*This article provides information on the implementation of educational transformation and the role of digital technologies, in particular AR technologies, in today's globalization process. Also, the types of AR technologies, their fields of application and the contents of the software are revealed.*

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### **Introduction :**

Technology has enhanced and mediated this era, which is also the age of technology. In this day and age, people desire to create rich experiences that advance technology rather than just live a natural existence. One such invention is AR (augmented reality - augmented reality), a technological advancement that enables individuals to carry out numerous experiments, conduct laboratories, travel to remote locations, visit other planets, and even travel back in time.

Digital technologies have altered the nature and scope of education in the modern era, and they have also prompted the establishment of plans and policies for their global integration. Using digital technology has also made it more difficult to comprehend, adapt, and build the educational system so that instruction is of a high enough standard to keep up with modern technological developments. The usage of digital technology in education has increased as a result of these concerns. Particularly, the epidemic has highlighted a lack of knowledge and insufficient digital competence in many schools, increasing disparities, inequities, and learning process losses. This has made it necessary to build on knowledge and experience in order to improve schools' digital readiness and ability, raise the degree of digitization, and complete a successful digital transformation.

The term "digitalization" was originally used in 1995 by American computer scientist Nicholas Negroponte, who stressed that it refers to the process of moving from processing atoms to processing bits [7]. K. Schwab proclaimed the worldwide transition to the stage of the fourth industrial revolution in 2016 at the World Economic Forum in Davos, Canada. The growth of digital technologies (new computing, advanced

recording, and the Internet of Things), reflection of the physical world (artificial intelligence and robots, cutting-edge technologies, additive manufacturing, and three-dimensional printing (3D printing)), human transformation (biotechnology, neurotechnology, VR and AR technologies), and environmental integration (energy harvesting and transmission, geoengineering, and space technology) are its main focuses [8].

### Literature review:

As technology develops and the digital world becomes more perceptible, AR applications get more complex, and chances to accurately forecast and use AR context material arise.

According to P. Madanipour and C. Cohrssen's study [6], augmented reality (AR) technology encourage students' engagement in the learning process, persistence, focus, and creativity, as well as motivation, enthusiasm, and social connection. observed that it heightens involvement and mystery. Additionally, using AR technology allowed pupils to examine items from various angles.

Today's simulation technologies, such concurrent learning and feedback, are revolutionizing education by enabling students to gain critical skills by engaging and experiencing virtual field experiences or real-world events [1], [3],[2],[4],[5].

These simulations and augmented reality (AR) apps are seen to be helpful in blended learning settings, particularly when adopting flipped classroom techniques [4]. They complement in-person instruction.

### Methodology

The theoretical and practical elements of developing AR apps based on AR technology are covered in this article. The several AR technology kinds and the program's potentials were examined and made clear.

### Result and discussion

The use of interactive digital features superimposed over the surroundings of physical items is known as augmented reality (AR) technology. Through a visual gadget, this technology seeks to augment the physical environment with virtual features. To observe the actual world, camera data is used to concurrently fill and track AR virtual objects. As a result, the actual world is chock-full of new information and fake features. Apps for popular smartphones and tablets, augmented reality goggles, fixed displays, projectors, and other technologies may all be used for this.

Another element used in AR technologies is the QR code.

A QR code may be used to encode data made up of characters (letters, numerals, and special characters). Information might take the form of a website URL, phone number, email address, the coordinates of an item, or anything similar. A QR scanner can read this two-dimensional barcode, and a smart device may then use hyperlinks to search for information about the website, product, advertisement, or anything else that includes the code (Figure 1).

They link the physical environment to digital information and communication systems.

A particular generating application is used to make a QR code after determining the amount of information that is needed. For instance, qrcoder.ru allows you to make QR codes online.



Figure 1 QR code

Nowadays, smartphones with cameras can read information from QR codes with ease. It is sufficient to start an application that reads the QR code to do this.

### **Types of AR technology**

Due to recent advancements in information technology, modern augmented reality technology comes in a variety of forms.

#### **Marker based AR**

Frequently, markers made with QR codes or other resemblances of similar patterns are used to activate a marker-based augmented reality (Figure 2). The filled entity program detects a marker when it is photographed in the natural world and opens the appropriate digital information.



Figure 2 Marker based AR

#### **Image-based AR**

The user may position a virtual object in any area with image-based AR, which is a modest improvement above marker-based AR (Figure 3).

Images serve as markers in this kind of AR. You may use it to establish the virtual environment and set up virtual objects. The animation of graphics in medical publications is one instance of image-based augmented reality.

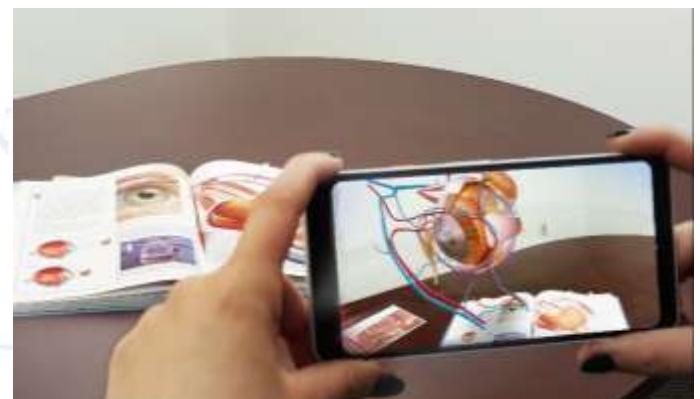


Figure 3 Image-based AR

#### **Location-based AR**

This kind of filled entity suggests that the genuine thing (or its completely reproduced picture) has graphic modifications superimposed on top of it, giving the real object a filled look (Fig. 4). Through the program, it is also possible to move and position things in the surrounding area. The technology's capability to distinguish things is crucial to the execution of overlay augmented reality.

To get the information it needs to do its work, AR software depends on AR devices like the camera, GPS, digital compass, and accelerometer. Combining GPS features may be used to create AR for a number of applications, like providing tourist information about destinations, marking the locations of stores, hotels, and restaurants, visualizing driving routes in real mode, etc.



Figure 4 Location-based AR

### ***Projection-based AR***

Compared to other forms of augmented reality, projection-based AR is a little unique. That means, the information may be seen without a mobile device. Projection-based AR, as the name implies, projects pictures onto a screen or other tangible surfaces via a video projector (Figure 5). Real things are utilized to project virtual graphics using this sort of augmented reality. It is frequently employed in the sector to visualize items.

Applications for augmented reality are no longer just for amusement. This technology has important uses in business, science, and research.

The use of AR as a fun and practical instructional program in schools and other learning environments boosts the efficacy of instruction by putting it into practice. Students' technical and creative abilities, as well as their interest in programming and digital media, grow and extend via hands-on learning. Especially in the early years of the educational system, AR can have a big influence. By bringing instructional resources and materials to life with brilliant colors and interactive elements using AR technology, teachers can educate pupils.



Figure 5 Projection-based AR

### **Software for creating AR applications**

#### ***Eyejack software***

One of the simplest platforms to utilize is Eyejack, which just involves adding a little movie to the trigger picture. The PC has to be installed with the application. You can download a sound to activate audio or surround sound. This program may use user audio and video files, is free, and is simple to use.

How to make an AR application with Eyejack:

1. Eyejack software is downloaded to the computer.
2. The trigger image will be uploaded (JPG or PNG file).
3. A video, GIF, or PNG file is uploaded for the reflection layer above the filled entity image.
4. The QR code provided for viewing is stored in the application.
5. Download the Eyejack app to your mobile device (iOS and Android).
6. The application will open and select the eye at the bottom of the screen.
7. The QR code will be scanned and then the trigger image will be displayed.

#### ***WebAR software***

Everything in WebAR is done in the browser using WebXR. The absence of a download need greatly accelerates the process. One of the free, user-friendly software programs that supports video and 3D object files is this one.

How to build a WebAR AR application:

1. Go to mywebar.com and select Sign Up to create an account.
2. Add a new project is selected.

3. Name the project and select the desired type of completed entity (QR code is free), then click the "Create" button.
4. Content available in the library will be downloaded to embed the QR code.
5. The saved image is selected and the QR code is scanned with the mobile device.

### *Arloop software*

In Arloop Studio, the user may add many items to a single AR interface and move 3D objects to the appropriate area in the AR world. Surface tracking, location services, and triggered images can all be used to produce augmented reality content. This web-based tool makes it simple to develop up to 10 free apps.

#### How to make an AR application in Arloop:

1. Go to <https://studio.arloopa.com/> and select "Create an account".
2. Create a new experience is selected.
3. Select the type of app you want to use by placing the app in the room or placing it in a specific location using the trigger image.
4. The type of AR displayed above the trigger image is selected.
5. A link will be placed on the top layer or an image/video/object and trigger image will be uploaded.
6. After customizing the interface, click the "Publish" button.

### Conclusion

The following conclusions concerning the application of AR technology in education can be taken from the analysis above: The use of augmented reality (AR) technologies can help students overcome obstacles, gain a better understanding of how to develop employability skills, improve communication with parents, and help teachers use their time more effectively. Specifically, augmented reality technologies can help students achieve academic success in general and raise the quality indicator in teaching a variety of subjects, support literacy development, and close the achievement gap between student groups.

Engineered functionalities may now be used to control AR applications. The player decides how to act, which course of action to take, and when the game should terminate. However, it is anticipated that future AR applications would be guided by conscious human thought. Even if it is hard to envision now, such control can be put into place in the next years.

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